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AUGMENTED FISH HEALTH MONITORING IN IDAHO

Annual Report
1990-91

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Bill Hutchinson and Tom Rogers are thanked for their support, and encouragement. The technical staff (Sharon Wavra, Roberta Bergstrom Scott, and Sharon Landin) should be recognized for their patience during hectic times, technical excellence in the laboratory, and technical assistance in the field. Rosanne Lokker's fine secretarial efforts typify the excellence of the Eagle Fish Health Laboratory in coordinating the laboratory and assisting in the field.

The following hatchery managers are thanked for their support of this project: Bud Ainsworth, Jr., Rick Alsager, Tom Levendofsky, Jerry McGehee, Gene McPherson, Bob Moore, Jerry Mowery, and Doug Young. Other hatchery staff, too numerous to mention here by name, are also thanked.

ABSTRACT

The Idaho augmented fish health monitoring contract DE-A179-87BP65903 was awarded in June 1987 and fully implemented in January 1988. The fourth annual report of activities serviced under this contract is presented. The prevailing fish health problems in 1990 include persistent infections caused by Myxobolus cerebralis and Flexibacter osvchronhilus. Subclinical infections of Renibacterium salmoninarum have been confirmed in pools of chinook kidney tissues using Enzyme-linked immunosorbant assay (ELISA), but to date, mortality and clinical signs were not apparent in juvenile anadromous fish. Clinical signs were observed in returning brood chinook at all chinook facilities. Furunculosis (Aeromonas salmonicida) was isolated in conjunction with mortality at Niagara Springs in the spring of 1991. The anadromous fish pathologist position was accepted by Doug Munson in July 1991. Complete diagnostic and inspection services were provided to eleven Idaho anadromous facilities. This report describes work done to meet contract agreements and summarizes the fish health findings of anadromous stocks reared at and returning to Idaho's facilities during 1990-1991.

FISH HEALTH MONITORING
Project 87-117
May 9, 1991

INTRODUCTION

Since 1987 Idaho Department of Fish and Game (IDFG), referred to herein as the Department, has participated in a Columbia Basin augmented fish health monitoring project funded by Bonneville Power Administration (BPA). The project was designed to upgrade and standardize fish health monitoring procedures used by anadromous fish producers in the Columbia Basin. The purpose of the project is to collect fish health information, evaluate it, and determine if fish health can effectively be used in mitigation programs.

The Department operates eleven fish production facilities in the Columbia Basin (Table 1, Figure 1). Fish health services for these facilities were provided by the Eagle Fish Health Laboratory located at Eagle, Idaho.

This report constitutes the results and progress for the period May 1990 to April 1991 or months 36-48 of the 60 month project. See Foott and Hauck (1988, 1989) and Hauck 1990 for previously reported information.

MATERIALS AND METHODS

Complete diagnostic, monitoring, non-infectious, and water quality services are conducted at the Eagle Fish Health Laboratory. The laboratory provides bacterial, parasitic, viral, histopathological, and water quality support services.

Monitoring methods for infectious diseases have not changed from those reported previously (Foott and Hauck, 1988, 1989). Fish health condition was assessed according to Goede (1988). Sampling and laboratory methods have been according to Amos (1985) and terms and conditions required by contract or interagency steering committee. Methods outlined by the Pacific Northwest Fish Health Protection Committee Model Comprehensive Fish Health Program were also considered and used as appropriate. Each monitoring or inspection case and sample collected on a given date is referred to herein as an "accession". The first numbers of each accession refer to the year of collection; the last number is the case number of the corresponding year.

A data storage and retrieval system has been developed using template DBase 3+ written with Clipper software program. This system is being used at the laboratory. It is also being modified to other Department programs now in use or under preparation.

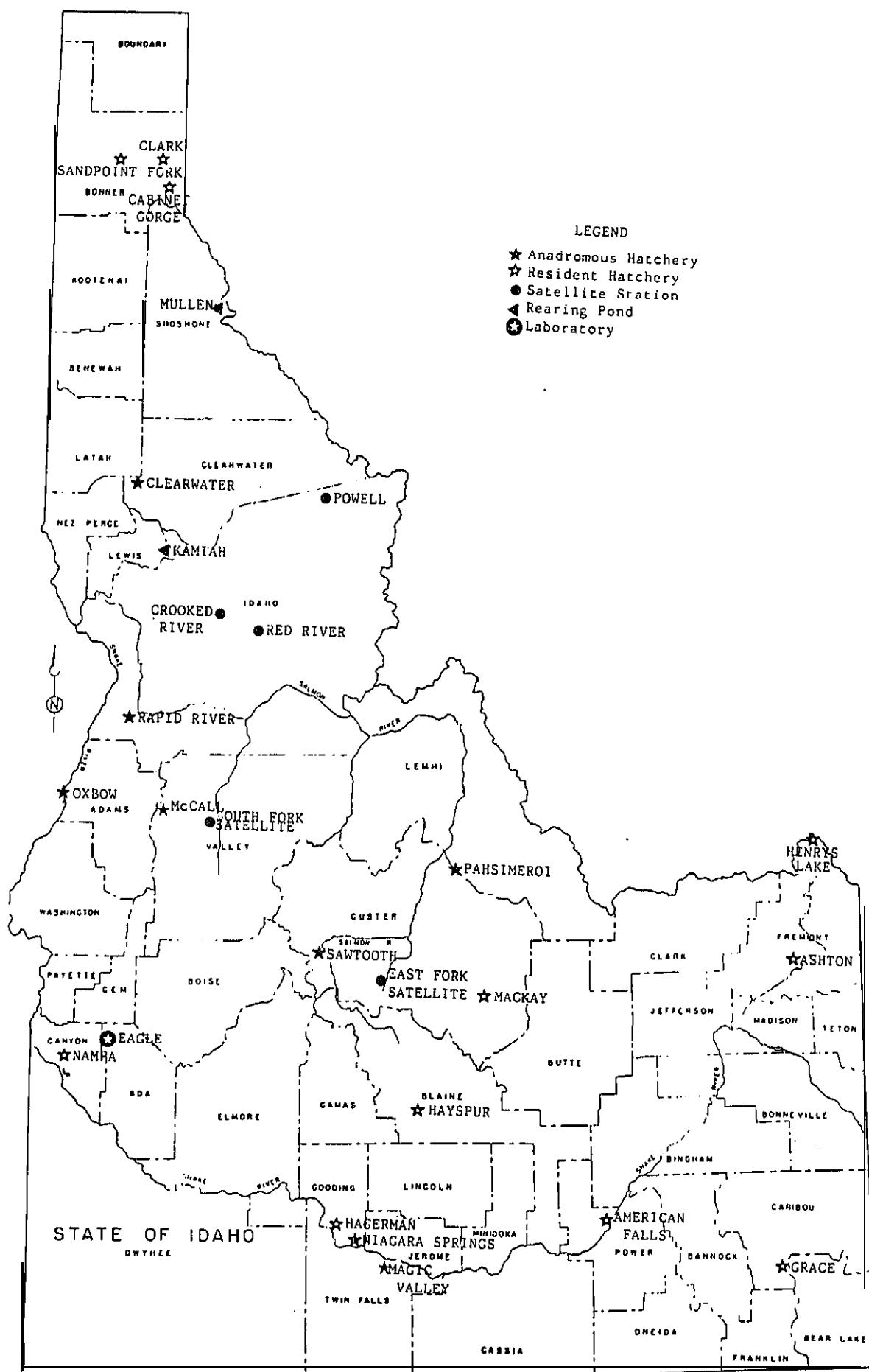
Table 1. List of upper Columbia River Basin anadromous facilities operated by Idaho Department of Fish and Game.

Facility	Water Source	Stock/species
Magic Valley Hatchery Bud Ainsworth, Manager Filer, Idaho	covered spring above Snake River	Pahsimeroi A steelhead, East Fork B steelhead, Clearwater B steelhead
McCall Fish Hatchery and South Fork Satellite Gene McPherson, Manager McCall, Idaho	Payette Lake	South Fork Salmon River, summer chinook
Niagara Springs Hatchery Jerry Mowery, Manager Wendell, Idaho	uncovered spring above Snake River	Pahsimeroi and Hells Canyon A steelhead
Oxbow Hatchery Doug Young, Manager Oxbow, Oregon	SNAKE RIVER	Hells Canyon A steelhead (adult holding/ incubation)
Pahsimeroi Hatchery Bob Moore, Manager Ellis, Idaho	Pahsimeroi River	Pahsimeroi summer chinook, A steelhead
Rapid River Hatchery Tom Levendofsky, Manager Riggins, Idaho	Rapid River	Rapid River and Hells Canyon spring chinook
Powell Satellite*+ Jerry McGehee, Manager Kamiah, Idaho	Lochsa River	Clearwater spring chinook
Red River Satellite*+ Jerry McGehee, Manager Kamiah, Idaho	South Fork Clearwater River	Clearwater spring chinook
Sawtooth Hatchery and East Fork Satellite Richard Alsager, Manager Stanley, Idaho	Salmon River	East Fork and Salmon River spring chinook

* Adult holding and juvenile release site for Clearwater Hatchery (under construction)

+ Not listed in BPA contract as part of augmented fish health monitoring project.

Figure 1. Location of Idaho Fish and Game fish propagation facilities.



RESULTS AND DISCUSSION

Project Staff and Equipment

In July of 1990, A. Douglas Munson started work at the Eagle Fish Health Laboratory as the anadromous fish pathologist.

Laboratory staff who assisted with field work were Roberta Bergstrom Scott, Sharon Landin, and Rosanne Lokker. A. Kent Hauck and Keith A. Johnson continued field work during the absence of an anadromous pathologist.

Project and Technical Steering Committee

Activities are according to contract terms and conditions specified in Appendix 1.

25 April 1990, Wenatchee, WA meeting attended by

A. K. Hauck

19 July 1990, Vancouver, WA meeting attended by

A. D. Munson

Fish Condition (Organosomatic Index Work)

Contract terms specify that organosomatic analyses to be collected at:

<u>Facility</u>	<u>Species</u>
McCall	Summer Chinook
Sawtooth	Spring Chinook
Rapid River	Spring Chinook

The specified analyses and additional analyses are collected at Pahsimeroi (Summer Chinook), Magic Valley (Steelhead A and B stocks), and Niagara Springs (Steelhead A stocks). Data is presented in Tables 2a-2n.

Comparisons of organosomatic data from steelhead hatcheries provided interesting results. Niagara Springs steelhead (Pahsimeroi STA) had high mesenteric fat and about 40% of tested fish had frayed gills. Lengths, weights, hematocrits and serum proteins were higher at Niagara Springs than at Magic Valley. Magic Valley steelhead appeared to have fewer problems or lesions of gills and liver than Niagara Springs. It is interesting to note that the fish at Niagara Springs had just experienced an epizootic of Flexibacter psychrophilus (CWD), were under environmental stress (overcrowding and hypoxia), and about to experience an epizootic of furunculosis, yet the data collected appears to be normal for this station, during that time of the year. The larger size of the steelhead at Niagara Springs is due partly to a richer diet (Rangen Salmon Starter) than used at Magic Valley (Rangen Trout Diet). Niagara Springs fish are in general the first egg takes and are usually several weeks older than Magic Valley's fish.

Chinook salmon preliberation evaluation revealed one of the healthiest in recent years. Preliberation samples did not have virus or BKD, while the organosomatic data appear to be insignificant between hatcheries. Hematocrits this year were higher throughout all ponds this year at Rapid River. This was expected since EIBS was not a problem this year. Pond circulation improvements at Rapid River have helped improve fish health dramatically over the past two years. Gills at all chinook stations appeared to be normal and better than the previous year except that Dermocystidium was isolated in low prevalences at Sawtooth and Rapid River.

A warmer station with mud bottom ponds, such as Pahsimeroi, will produce slightly larger and heavier fish than Sawtooth (colder and concrete raceways). Due to the difference in hatchery schemes it is difficult to assign much value to comparisons made between two different hatcheries. Comparisons made between two different years at the same hatchery should be kept to very general statements, using Gaussian and non-parametric statistics.

Augmented Fish Health and Pathogen Monitoring

The discussion of fish health monitoring is discussed in four sections: viral pathogens, bacterial pathogens, parasitic pathogens, and miscellaneous problems. Further discussions involve lab support services and water supply studies.

VIRAL PATHOGENS

Infectious Hematopoietic Necrosis Virus (IHN), the viral agent responsible for IHN was detected at Crooked River in spring chinook (accession 90-169). A total of 3 of 8 pools were found to be positive after transport from Dworshak hatchery. These were considered low titer carriers.

All other isolations of IHN were located from brood steelhead at Oxbow (accession 91-118), and Pahsimeroi (accessions 91-128 and 91-114). No mortality was attributed to IHN in juvenile anadromous fish.

Infectious Pancreatic Necrosis Virus (IPNV), the causative agent of IPN was isolated at Magic Valley in 1989 broodyear fish showing clinical signs (accessions 90-76, 90-77, and 90-78). As these fish entered the summer of 1990, no further isolations were observed and the culturists did not notice any signs suggestive of IPN. Following release, a stringent sanitation of Magic Valley was conducted to reduce or eliminate IPNV. IPNV has not been detected since.

IPNV was isolated from brood steelhead at Oxbow (accessions 91-106 and 91-118) Pahsimeroi (accessions 91-63, 91-76, 91-78 and 91-91) and Sawtooth (accessions 91-87a and 91-114).

Erythrocytic Inclusion Body Syndrome (EIBS), was found in Rapid River spring chinook (accession 90-246). Only one fish was found to be positive in a sixty fish sample. This fish was considered a carrier, and was not showing signs of the disease. No mortality was attributed to EIBS this last year.

Inclusion bodies suggestive of EIBS were detected in several Pahsimeroi brood steelhead (accession 91-93). These slides were sent to the Olympia Fish Center where John Morrison and Ray Brunson viewed the slides. These individuals considered the samples were negative. Because of the very few inclusions present EM confirmation was not feasible. Until confirmation is possible, this finding is considered negative. No losses can be attributed to this isolation.

BACTERIAL PATHOGENS

Renibacterium salmoninarum was not isolated in any juvenile chinook or steelhead at anadromous IDFG hatcheries except for 1990 brood spring chinook at Sawtooth Hatchery (accessions 91-120, 91-153, 91-154 in April and May). The decline in mortality and morbidity can be attributed to the management plan implemented in the IDFG anadromous hatcheries. Although side by side comparisons were not made at this level, hatchery control of Renibacterium seems to be a reality. Whether this protection is adequate once the fish leave the hatchery remains to be seen. This has brought the level of infection below our ability to detect it with the fluorescent antibody test (FAT).

Returning brood chinook salmon and steelhead did produce positive isolations using FAT. The McCall hatchery operations did not yield any positive broodfish from the South Fork of the Salmon River trap. Two fish with gross lesions in the spleen and kidney were not utilized in the spawn. Positive brood chinook were found at the Powell trap (accession 90-225), Pahsimeroi accessions 90-226 and 90-237), Rapid River (accession 90-222) and Sawtooth (accessions 90-212, 90-214, 90-215, 90-223, 90-224, 90-227 and 90-244). Positive brood steelhead isolations were at Sawtooth (accessions 90-89, 90-102, 90-142 and 91-12).

Bacterial Coldwater Disease caused by Flexibacter psychrophilus caused chronic mortalities at Niagara Springs (accessions 91-05, 91-20, and 91-53) in Pahsimeroi steelhead. Other stress factors (overcrowding and hypoxia) most certainly predisposed the fish to disease. The mortality averaged 0.08% per day and was treated with oxytetracycline medicated feed. Response to the medicated feed was disappointing, thus the medication was doubled until results were seen (21-28 days). With the improvement in technology, F. psychrophilus isolations have been increasing.

A mortality at Magic Valley (0.5% per day) was initially attributed to Flexibacter psychrophilus which was isolated in the initial sampling. Subsequent cultures throughout the epizootic did not produce this bacteria again. It appears this was a nutritional problem. To offset this, oxytetracycline medicated feed is now recommended to be in the soft moist diet.

Furunculosis caused by Aeromonas salmonicida caused mortality at Niagara Springs (accession 91-102) at a daily average mortality of 1.17%. Due to the release of these fish immediately after the samples were taken, chemotherapy was not administered to these fish. No further information has been received on these fish as they traveled down stream (pertaining to A. salmonicida).

Enteric Redmouth caused by Yersinia ruckeri, was not isolated nor were signs of infection noticed by pathologists or hatchery personnel.

PARASITIC PATHOGENS

Whirling Disease spores (Myxobolus cerebralis) were detected in most pools of juvenile summer chinook from Pahsimeroi (accessions 90-100, 90-141, 90-192). Pahsimeroi Hatchery had one case where all pools were negative (accession 90-140). Sawtooth Hatchery had positive pool isolations (accessions 91-104, 91-110, 91-116, 91-129 and 91-130).

It is unclear if the prevalence of infection is increasing. One sample (90-140) showed 0% prevalence, while pooled samples earlier and later (90-100 and 90-141) were 100% infected. Further research is being considered to find out the earliest age chinook salmon can be exposed to E. cerebralis and be refractory to

infection. Presently, in the absence of a suitable chemotherapeutic agent, management practices to avoid the etiologic agent at susceptible times, are being considered.

Ceratomyxa Shasta - The signs of C. Shasta were not noticed nor were the spores evident when gut samples were taken (except for two brood fish (chinook) from Powell). Presently, C. Shasta does not appear to be a problem in the anadromous hatcheries of IDFG. Probably the anadromous fish become infected when they outmigrate in the spring.

Proliferative Kidney Disease The signs of the PKX agent were not noticed during inspections, therefore further sampling was unnecessary.

Other Fish Losses Attributed to Pathogens

Ichthyonhthirius multifilis was found at McCall and Crooked River, but no fish losses can be attributed to this agent this year.

Conclusions

The Idaho Department of Fish and Game's involvement in this project has been productive. To date, surveillance of juvenile fish and returning brood fish at anadromous stations has increased. Diagnostic services have increased yearly and the level of technology present at the Eagle Fish Health Laboratory has expanded the laboratory's ability, making it a modern, functional fish diagnostic center for the state of Idaho. Directly or indirectly, our involvement in this project has been instrumental in improving the quality of Idaho's anadromous hatchery fish.

The anadromous hatchery program has benefitted from the BPA project through monthly inspections, analysis of hatchery constraints, and funding to achieve anadromous hatchery goals. Sawtooth Hatchery has benefitted from this program, by the pathologist (funded by BPA) and hatchery staff implementing programs to manage around etiological agents such as Disalostomum, Myxobolus cerebralis and Renibacterium salmoninarum. Through BPA monitoring, IDFG pathologists have been able to evaluate iodine disinfectants, erythromycin injections erythromycinmedicated feed treatments, and BKD segregation. All of these techniques have been successful in limiting BKD at Sawtooth Hatchery and have been implemented at McCall, Rapid River, and Pahsimeroi (not including BKD segregation).

Rapid River has been structurally modified by suggestion of BPA funded pathologists and has helped with a perennial EIBS and coldwater disease problem.

The steelhead program at IDFG hatcheries has been successful in limiting IHN and IPN through a culling program. Feed performance evaluation by IDFG pathologists have produced a higher quality fish (fins, and body condition) at Magic Valley. Niagara Springs has implemented lower densities, which has relieved coldwater disease related mortalities, and hopefully eliminated the perennial stress (overcrowding and hypoxia) experienced in the spring before outplanting.

A program to manage around whirling disease has been implemented at Pahsimeroi. Eagle Fish Health Laboratory pathologists have suggested to rear fish at Sawtooth Hatchery in uncontaminated well water to 7.0 centimeters in length. Then these fish will be ponded at Pahsimeroi in the earthen ponds. This program will be evaluated by serial necropsy and standard diagnostic methods for whirling disease. The augmented fish monitoring project has been instrumental in developing and implementing a fish health program for Idaho anadromous fish.

The Augmented Fish Health Monitoring Project for the 1990-1991 year has proven to be quite successful. Through this project, many anadromous hatchery problems have been addressed and solved. Bacterial kidney disease, although pervasive, has been suppressed through management and chemotherapy. In the coming years, implementation of current technology will further suppress or eliminate the disease from anadromous hatchery stocks.

The Eagle Fish Health Laboratory has been the foundation of identifying disease problems throughout the state. Whether infectious or non-infectious, the laboratory has been able in most cases to identify the etiologic agent or predisposing condition.

Through the BPA funded monitoring, etiologic agents have been spotted before problems have actually existed. Hatchery personnel were subsequently warned of a pending outbreak and could implement the correct management for healthy culture. As we enter into the fifth year of this BPA project, the Eagle Fish Health Laboratory has established itself as a vital part of the IDFG hatchery program.

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Table 2a.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-34a1 LOCATION: RR
 SPECIES: SC AUTOPSY DATE: 02/21/91
 STRAIN: RR AGE: BY90
 UNIT: 1A SAMPLE SIZE: 10
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S): DM/RL/SL/SW
 REMARKS:

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	113.70	9.55	8.40
WEIGHT	18.19	4.34	23.88
KTL*	1.22	0.13	8.59
CTL**	4.22	0.43	9.47
HEMATOCRIT	34.80	11.04	31.73
LEUCOCRIT	0.33	0.12	37.16
SERUM PROTEIN	5.78	0.81	13.99

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES As PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
100	N 80	N 100	0 100	0	B 10	0 100	N 100	A 0	0 0
31	O F 0	S 0	1 0	1 0	R 70	1 0	O S 0	B 80	1 0
32	O C 0	L 0	2 0	2 0	G 0	2 0	O M 0	c 20	2 90
11	O M 0	S&L 0		3 80	NO 0		G 0	D 0	3 10
12	O P 20	I 0		4 20	E 20		U 0	E 0	
11	OOT 0	OT 0	$\bar{X}= 0.00$		OT 0	$\bar{X}= 0.00$	OOT 0	F 0	
12	0	0 0		$\bar{X}= 3.20$				OT 0	x=2.10
11	0								
12	0								
OT	0								

SUMMARY OF NORMALS

100	80	100	100	0	80	100	100	80	0
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EX M: 0 F: 10 u: 0

GENERAL REMARKS

INS: GONADS:
 KIN: OTHER:

Table 2b.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-34a2 LOCATION: RR
 SPECIES: SC AUTOPSY DATE: 02/21/91
 STRAIN: RR AGE: BY89
 UNIT: 2A SAMPLE SIZE: 10
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S): DM/SL/RL/SW
 REMARKS:

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	116.60	4.77	4.09
WEIGHT	18.69	2.09	11.19
KTL*	1.18	0.05	7.42
CTL**	4.36	0.37	8.57
HEMATOCRIT	40.50	3.72	9.18
LEUCOCRIT	0.48	0.68	16.64
SERUM PROTEIN	5.75	0.77	13.43

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHES		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	100	N	100	N	100	0	100	0	0	B	60	0	100	N	100	A	0	0	10
B1	OF	0		S	0	1	0	1	0	R	40	1	0	S	0	B	50	1	80
B2	OC	0		L	0	2	0	2	0	G	0	2	0	M	0	c	50	2	0
E1	OM	0		S&L	0			3	20	NO	0			G	0	D	0	3	10
E2	OP	0		I	0			4	80	E	0			U	0	E	0		
H1	OOT	0		OT	0	\bar{X} =	0.00			OT	0	\bar{X} =	0.00	OOT	0	F	0		
H2	0			0	0			\bar{X} =	3.80							OT	0	Z=	1.10
M1	0																		
M2	0																		
OT	0																		

SUMMARY OF NORMALS

100	100	100	100	0	100	100	100	50	0
SEX	M:	0	F:	0	U:	10			

GENERAL REMARKS

FINS:

GONADS:

SKIN:

OTHER: 1 WITH DERMOCYSTIDIAM

Table 2c.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-34131
 SPECIES: SC
 STRAIN: RR
 UNIT: 1B
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S): DM/SL/RL/SW
 REMARKS:

LOCATION: RR
 AUTOPSY DATE: 02/21/91
 AGE: BY89
 SAMPLE SIZE: 10

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	105.20	5.87	5.58
WEIGHT	14.26	2.32	16.26
KTL*	1.22	0.12	10.04
CTL**	21.41	0.49	10.04
HEMATOCRIT	37.62	3.87	10.29
LEUCOCRIT	0.48	0.08	16.64
SERUM PROTEIN	5.55	0.47	8.42

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHES		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	100	N	100	N	100	0	100	0	0	B	10	0	100	N	100	A	0	0	0
B1	O	F	0	S	0	1	0	1	0	R	90	1	O	S	0	B	80	1	0
B2	OC	0		L	0	2	0	2	0	G	0	2	O	M	0	c	20	2	100
E1	OM	0		S&L	0			3	70	NO	0			G	0	D	03		0
E2	OP	0		I	0			4	30	E	0			U	0	E	0		
H1	OOT	0		OT	0	\bar{X} =	0.00			OT	0	\bar{X} =	0.00	OOT	0	F	0		
H2	0			0	0			\bar{X} =	3.30							OT	0	x=	2.00
M1	0																		
M2	0																		
OT	0																		

SUMMARY OF NORMALS

100	100	100	100	0	100	100	100	80	0
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SEX M: 2 F: 3 U: 5

GENERAL REMARKS

FINS: GONADS:

SKIN: OTHER:

Table 2d.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-34332

LOCATION: RR

SPECIES: SC

AUTOPSY DATE: 02/21/91

STRAIN: RR

AGE: BY89

UNIT: 2B

SAMPLE SIZE: 10

REASON FOR AUTOPSY: PRE-LIB

INVESTIGATOR(S): DM/SL/RL/SW

REMARKS:

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	106.80	10.58	9.91
WEIGHT	14.32	3.81	26.58
KTL*	6.40	0.12	10.63
CTL**	4.09	0.44	10.90
HEMATOCRIT	41.05	4.15	10.10
LEUCOCRIT	0.35	0.13	36.88
SERUM PROTEIN	5.41	1.26	23.26

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

YES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
100	N 100	N 100	0 100 0	0 B 20	0 100 N 100	A 0 0 30			
1	O F 0	S 0	1 0 1 0	R 80	1 0 S 0	B 70 1 50			
2	O C 0	L 0	2 0 2 0	G 0	2 O M 0	C 30 2 20			
1	O M 0	S&L 0	4 70 NO 0		G 0	D 03 0			
2	O P 0	I 0	0.00 30 E 0		U 0	E 0			
1	OOT 0	OT 0	\bar{X} = OT 0	\bar{X} = 0.00	OOT 0	F 0			
2	0	0 0	\bar{X} = 3.30			OT 0	x=0.90		
1	0								
2	0								
T	0								

SUMMARY OF NORMALS

100	100	100	100	0	100	100	100	70	0
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EX M: 0 F: 0 U: 10

GENERAL REMARKS

INS: GONADS:

KIN: OTHER:

Table 2e.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-34c2
 SPECIES: SC
 STRAIN: RR
 UNIT: 2C
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S): DM/SL/RL/SW
 REMARKS:

LOCATION: RR
 AUTOPSY DATE: 02/21/91
 AGE: BY89
 SAMPLE SIZE: 10

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	114.30	6.24	5.46
WEIGHT	16.86	3.67	21.77
CTL*	1.11	0.11	9.51
CTL**	4.02	0.38	9.41
HEMATOCRIT	37.50	12.38	33.02
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.11	0.60	9.74

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
 :*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

YES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
100 N	100	N	100	0 0	B 60	0 100	N 100	A 0	0 10
1 0 F	0	S	0	1 0	R 40	1 0	S 0	B 100	1 90
2 0 c	0	L	0	2 0	G 0	2 0	M 0	C 0	2 0
1 0 M	0	S&L	0	3 10	NO 0		G 0	D 0	3 0
2 OP	0	I	0	4 90	E 0		U 0	E 0	
1 OOT	0	OT	0	X= 0.00	OT 0	X= 0.00	OOT 0	F 0	
2 0		0	0	x= 3.90				OT 0	X=0.90
1 0									
2 0									
T 0									

SUMMARY OF NORMALS

100	100	100	100	0	100	100	100	100	0
EX	M:	0	F:	0	U:	10			

GENERAL REMARKS

CNS : GONADS:
 <IN: OTHER:

Table 2f.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-34d2
 SPECIES: SC
 STRAIN: RR
 UNIT: 2D
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S): DM/RL/SL/SW
 REMARKS:

LOCATION: RR
 AUTOPSY DATE: 02/21/91
 AGE: BY89
 SAMPLE SIZE: 10

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	117.20	5.20	4.44
WEIGHT	17.59	2.91	16.55
KTL*	1.09	0.10	8.85
CTL* *	3.93	0.30	8.85
EMATOCRIT	0.80	2.98	7.31
EUCOCRIT	0.48	0.08	16.64
SERUM PROTEIN	5.11	0.56	10.89

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

YES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
100	N 100	N 100	0 100	0	B 50	0 100	N 100	A 0	0 10
L O F 0	S 0	1 0	1 0	R 50	1 0	S 0	B 100	1 0	
2 O C 0	L 0	2 0	2 30	G 0	2 0	M 0	C 0	2 90	
L O M 0	S&L 0	3 50	NO 0			G 0	D 03	0	
2 O P 0	I 0	4 20	E 0			U 0	E 0		
L OOT 0	OT 0	$\bar{X}= 0.00$	OT 0	$\bar{X}= 0.00$		F 0			
0	0	x= 2.90				OT 0	$\bar{X}=1.80$		
0									
0									
0									

SUMMARY OF NORMALS

100	100	100	100	0	100	100	100	100	0
X	M: 0	F: 0	U: 10						

GENERAL REMARKS

NS: GONADS:
 IN: OTHER:

Table 2g.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-35
 SPECIES: SU
 STRAIN: SF
 JNIT:
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S): DM/RL/SL
 REMARKS:

LOCATION: MC
 AUTOPSY DATE: 02/22/91
 AGE: BY89
 SAMPLE SIZE: 60

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	117.77	9.63	8.18
WEIGHT	18.72	4.88	26.06
KTL*	1.12	0.13	11.39
:TL**	4.06	0.47	11.58
HEMATOCRIT	41.80	4.43	10.00
LEUCOCRIT	0.41	0.12	29.63
SERUM PROTEIN	7.06	1.24	17.53

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

 VALUES AS PERCENTS OF TOTAL SAMPLE

YES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
100	N 100	N 100	0 100	0 0	B 2	0 100	N 100	A 3	0 0
1	O F 0	S 0	1 0	1 0	R 98	1 0	S 0	B 90	1 95
2	O C 0	L 0	2 0	2 13	G 0	2 0	M 0	C 7	2 5
1	O M 0	S&L 0		3 32	NO 0		G 0	D 0	3 0
2	O P 0	I 0		4 55	E 0		U 0	E 0	
1	OOT 0	OT 0	$\bar{X}= 0.00$	OT	0	$\bar{X}= 0.00$	OOT 0	F 0	
2	0	0 0		$\bar{X}= 3.40$				OT 0	$\bar{X}=1.10$
1	0								
2	0								
T	0								

 SUMMARY OF NORMALS

100	100	100	100	0	100	100	100	93	0
EX	M: 0	F: 0	U: 60						

=====

GENERAL REMARKS

CNS :

GONADS:

(IN:

OTHER:

Table 2h.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-37
 SPECIES: SU
 STRAIN: PAH
 UNIT:
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S): DM/RB/SW
 REMARKS:

LOCATION: PA
 AUTOPSY DATE: 02/27/91
 AGE:
 SAMPLE SIZE: 20

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	131.65	13.79	10.48
WEIGHT	22.79	7.71	33.84
KTL*	0.97	0.15	15.79
CTL**	3.56	0.55	15.42
HEMATOCRIT	39.63	3.85	9.71
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.33	1.04	16.38

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
100	N 85	N 100	0 100	0 0	B 55	0 100	N 100	A 0	0 30
1	O F 0	S 0	1 0	1 10	R 45	1 0	S 0	B 90	1 70
2	O c 0	L 0	0 2	50	G 0	2 0	O M 0	c 10	2 0
1	O M 5	S&L 0		3 40	NO 0		G 0	D 03	0
2	O P 10	I 0		4 0	E 0		U 0	E 0	
1	OOT 0	OT 0	$\bar{X}=$	0.00	OT 0	$\bar{X}=$	O.OOT 0	F 0	
2	0	0 0		$\bar{X}= 2.30$				OT 0	$\bar{X}=0.70$
1	0								
2	0								
IT	0								

SUMMARY OF NORMALS

100	85	100	100	0	100	100	100	100	0
-----	----	-----	-----	---	-----	-----	-----	-----	---

SEX M: 0 F: 0 U: 20

GENERAL REMARKS

INS: GONADS:
 KIN: OTHER:

Table 2i.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-38
 SPECIES: SC
 STRAIN: EF
 UNIT:
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S): DM/RB/SW
 REMARKS:

LOCATION: ST
 AUTOPSY DATE: 02/28/91
 AGE: BY89
 SAMPLE SIZE: 20

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	121.20	6.53	5.39
WEIGHT	19.42	3.89	20.02
CTL*	1.08	0.08	7.60
CTL**	3.90	0.29	7.53
HEMATOCRIT	39.18	3.48	8.87
LEUCOCRIT	0.90	0.35	38.65
SERUM PROTEIN	4.81	1.13	23.45

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

YES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
100	N 100	N 100	0 100	0	B 80	0 100	N 100	A 0	0 0
1	O F 0	S 0	1 0	1 0	R 20	1 0	S 0	B 90	1 100
2	O C 0	L 0	2 0	2 5	G 0	2 0	M 0	C 10	2 0
1	OM 0	S&L 0		3 35	NO 0		G 0	D 03	0
2	OP 0	I 0		4 60	E 0		U 0	E 0	
1	OOT 0	OT 0	$\bar{X}= 0.00$		OT 0	$\bar{X}= 0.00$	T 0	F 0	
2	0	0 0		$\bar{X}= 3.55$				OT 0	$\bar{X}=1.00$
1	0								
2	0								
I	0								

SUMMARY OF NORMALS

100	100	100	100	0	100	100	100	90	0
EX	M: 0	F: 0	U: 20						

GENERAL REMARKS

CNS : GONADS:
 (IN: OTHER:

Table 2j.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-45

SPECIES: SC

STRAIN: SAW

UNIT:

REASON FOR AUTOPSY:

INVESTIGATOR(S): DM/RB/SW

REMARKS:

LOCATION: ST

AUTOPSY DATE: 03/06/91

AGE: BY89

SAMPLE SIZE: 60

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	121.18	9.00	7.43
WEIGHT	19.97	5.03	25.18
KTL*	1.09	0.09	8.51
CTL**	3.94	0.33	8.59
HEMATOCRIT	39.48	5.69	14.41
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	5.59	5.14	9.94

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 98	N 100	N 100	0 100	0 0	B 87	0 100	N 100	A 0	0 8
31 O F 0	S 0	11 0 1	B 47	1 0	S 0	b 88	1 65		
32 O C 0	L 0	2 0 2 8	G 0	2 0	M 0	c 10	2 26		
31 2 M 0	S&L 0	3 17	NO 3		G 0	D 0	3 0		
22 O P 0	I 0	4 75	E 3		U 0	E 0			
11 OOT 0	OT 0	$\bar{X}=0.00$	OT 0	$\bar{X}=0.00$	OOT 0	F 0			
12 0	0 0	$\bar{X}=3.67$				OT 0	$\bar{X}=1.13$		
11 0									
12 0									
OT 0									

SUMMARY OF NORMALS

98	100	100	100	0	93	100	100	88	0
SEX	M: 0	F: 0	U: 59						

GENERAL REMARKS

INS:

GONADS:1 PRECOCIOUS MALE

KIN:

OTHER: 7 DERMOCYSTIDIUM

Table 2k.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-50 LOCATION: NS
 SPECIES: STA AUTOPSY DATE: 03/12/91
 STRAIN: PAH AGE:
 UNIT: SAMPLE SIZE: 20
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S): DM/SW
 REMARKS:

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	250.20	22.43	8.96
WEIGHT	341.00	a.57	25.14
KTL*	0.23	0.04	17.56
CTL**	0.84	0.15	84.09
HEMATOCRIT	52.75	7.16	3.57
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	5.47	1.31	23.95

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
 **CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 100	N 60	N 100	0, 100	0 0	B 95	0 100	N 100	A 25	0 0
B1 0	F 40	S 0	1 0	1 0	R 5	1 0	s 0	B 75	1 0
B2 0	C 0	L 0	2 0	2 0	G 0	2 0	M 0	c 0	2 65
E1 0	M 0	S&L 0		3 0	NO 0		G 0	D 0	3 35
E2 OP	0	I 0		4 100	E 0		U 0	E 0	
H1 OOT	0	OT 0	$\bar{X} = 0.00$		OT 0	$\bar{X} = 0.00$	OOT 0	F 0	
HZ 0		0 0		$\bar{X} = 4.00$				OT 0	x=2.35
M1 0									
M2 0									
OT 0									

SUMMARY OF NORMALS

100	60	100	100	0	100	100	100	100	0
-----	----	-----	-----	---	-----	-----	-----	-----	---

SEX M: 0 F: 0 U: 20

GENERAL REMARKS

FINS: PECTORAL FINS ERODED

GONADS:

SKIN:

OTHER:

Table 21.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-59
 SPECIES: DWO
 STRAIN: STA
 UNIT:
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S):
 REMARKS:

LOCATION: MV
 AUTOPSY DATE: 03/21/91
 AGE:
 SAMPLE SIZE: 20

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	215.10	22.05	0.10
WEIGHT	105.25	35.80	0.34
KTL*	0.98	0.09	0.09
CTL**	3.55	1.08	0.31
HEMATOCRIT	47.29	2.88	0.06
LEUCOCRIT	1.16	0.36	0.31
SERUM PROTEIN	5.46	0.57	0.10

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO- BRANCHES		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	95	N	100	N	100	0	100	0	0	B	100	0	100	N	100	A	0	0	0
B1	O F	0		S	0	1	0	1	0	R	0	1	0	S	0	B	100	1	0
B2	O C	0		L	0	2	0	2	0	G	0	2	0	M	0	c	0	2	100
E1	5 M	0		S&L	0			3	0	NO	0			G	0	D	0	3	0
E2	O P	0		I	0			4	100	E	0			U	0	E	0		
H1	OOT	0		OT	0	\bar{X} = 0.00		OT	0	\bar{X} = 0.00		OOT	0		0	F	0		
H2	0			0	0			\bar{X} = 2.50							0	OT	0	X = 1.25	
M1	0																		
M2	0																		
OT	0																		

SUMMARY OF NORMALS

95	100	100	100	100	100	100	100	100	100
SEX	M:	0	F:	0	U:	20			

GENERAL REMARKS

FINS: 20/20 FINS ERODED

GONADS:

SKIN:

OTHER:

Table 2m.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-61
 SPECIES: EF
 STRAIN: STB
 UNIT:
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S):
 REMARKS:

LOCATION: MV
 AUTOPSY DATE: 03/26/91
 AGE:
 SAMPLE SIZE: 20

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	222.40	10.72	4.82
WEIGHT	118.82	19.08	16.06
KTL*	1.08	0.00	0.00
CTL**	3.90	0.00	0.00
HEMATOCRIT	45.29	2.39	5.28
LEUCOCRIT	0.88	0.39	44.32
SERUM PROTEIN	4.80	0.61	12.70

*EXPRESSED AS KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

YES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
100	N 100	N 100	0 100	0	0	0 100	N 100	A 100	0 0
1	O F	0	S	0	1	0	R	1 5	1
2	O C	0	L	0	2	0	G	0 2	O M
1	O M	0	S&L	0	3	0	NO	0	G
2	O P	0	I	0	4	100	E	0	U
1	OOT	0	OT	0	$\bar{X}= 0.00$	OT	0	$\bar{X}= 0.00$	OOT
2	0	0	0	0	$\bar{X}= 4.00$				OT
1	0								$\bar{X}=1.95$
2	0								
T	0								

SUMMARY OF NORMALS

0 0 0 0 0 0 0 0 0 0

EX M: 0 F: 0 U: 0

GENERAL REMARKS

INS: GONADS:

KIN: OTHER:

Table 2n.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 91-62
 SPECIES: PAH
 STRAIN: STA
 UNIT:
 REASON FOR AUTOPSY: PRE-LIB
 INVESTIGATOR(S):
 REMARKS:

LOCATION: MV
 AUTOPSY DATE: 03/26/91
 AGE :
 SAMPLE SIZE: 20

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	228.27	18.52	8.11
WEIGHT	133.21	34.14	25.63
CTL*	1.12	0.00	0.00
CTL**	4.05	0.00	0.00
HEMATOCRIT	49.73	3.41	6.86
LEUCOCRIT	0.86	0.29	33.74
SERUM PROTEIN	4.98	0.77	15.39

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

YES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
100 N	95	N 100	0 100	0 0	B 100	0 100	N 100	A 100	0 95
1 O F 0	S 0	1 0 1 0	R 0	1 0 S 0	B 0	1 0 S 0	B 0	1 5	
2 O C 0	L 0	2 0 2 0	G 0	2 0 M 0	C 0	2 0 M 0	C 0	2 0	
1 OM 5	S&L 0	3 0	NO 0	G 0	D 03	0			
2 O P 0	I 0	4 100	E 0	U 0	E 0				
1 OOT 0	OT 0	$\bar{X} = 0.00$	OT 0	$\bar{X} = 0.00$	OOT 0	F 0			
2 0	0 0	$\bar{X} = 4.00$			OT 0	$\bar{X} = 0.00$			
1 0									
2 0									
T 0									

SUMMARY OF NORMALS

0 0 0 0 0 0 0 0 0 0

EX M: 0 F: 0 U: 0

GENERAL REMARKS

INS: GONADS:
 KIN: OTHER:

Table 3. Summary of augmented fish health inspections of adult salmon and steelhead at Idaho Columbia River tributary hatcheries.

<u>Facility</u>	<u>Date</u>	<u>Accessions</u>	<u>Stock(a)</u>	<u>Results(b)</u>
East Fork Satellite	4/1991	91-89	East Fork STB	0/4 VH
				0/4 VP
	4/1991	91-103		0/21 VH
				0/21 VP
				0/8 BK
	4/1991	91-109		0/8 VH
				0/8 VP
				0/8 BK
				0/12 PW
				0/12 PC
	4/1991	91-115		0/8 BK
				0/a VP
				0/a VH
				1/2 PW
	4/1991	91-130		0/6 BK
				0/6 VH
				0/6 VP
				1/1 PW
	5/1991	91-145		0/56 VE
				0/29 BK
Oxbow	3/1991	91-52	Hells Canyon STA	0/3 PC
	4/1991	91-69		0/1 BK
				0/2 PC
				0/52 VH
				0/52 VP
	4/1991	91-81		0/44 BK
				0/20 PC
				0/20 PW
				0/65 VP
				0/65 VH
	4/1991	91-86		0/47 VP
				0/47 VH
	4/1991	91-100		6/233 VP
				0/233 VH
				0/56 VE
	4/1991	91-106		1/144 VP
				0/144 VH
	4/1991	91-118		1/61 VH
				1/61 VP
	4/1991	91-119		0/16 VP
				0/16 VH
	5/1991	91-131		0/55 VP
				0/55 VH

Table 3. continued

<u>Facility</u>	<u>Date</u>	<u>Accessions</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Pahsimeroi	3/1991	91-63	Pahsimeroi STA	1/22 VP
				0/22 VH
	3/1991	91-66		0/22 VP
				0/22 VH
	3/1991	91-71		0/48 VP
				0/48 VH
	4/1991	91-76		0/45 VH
				1/40 VP
	4/1991	91-87		6/80 VP
				0/80 VH
	4/1991	91-91		0/66 VH
				2/66 VP
	4/1991	91-93		0/20 VH
				0/20 VP
				0/20 PW
				0/19 VE
	4/1991	91-105a	Pah/Saw STA	0/60 VP
				0/60 VH
				0/60 BK
	4/1991	91-111	Pahsimeroi STA	0/48 VH
				0/48 VP
	4/1991	91-128	Pahsimeroi STA	1/32 VH
				0/32 VP
				0/32 BK
Sawtooth	5/1991	91-141		0/14 VH
				0/14 VP
				0/14 BK
	5/1991	91-144		0/7 VH
				0/7 VP
				0/7 BK
	4/1991	91-90	Sawtooth STA	0/11 VH
				0/11 VP
	4/1991	91-104		0/8 VH
				0/8 VP
				0/5 PC
				1/1 PW
	4/1991	91-110		0/4 VH
				0/4 VP
				0/4 BK
				0/3 PC
				1/1 PW
	4/1991	91-116		0/6 VH
				0/6 VP
				0/6 PC
				1/2 PW

Table 3. continued

<u>Facility</u>	<u>Date</u>	<u>Accessions</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Sawtooth	4/1991	91-129	Sawtooth STA	0/21 BK 0/21 VP 0/21 VH 2/5 PW 0/21 PC
	4/1991	91-135		0/6 BK
	5/1991	91-137		0/4 BK 0/30 VE 1/4 VP 0/4 VH

(a) Stock Abbreviations

BT = brook trout
 SC = spring chinook
 STA = A steelhead
 STB = B steelhead
 su = summer chinook

(b) Pathogen Abbreviations

BC = bacterial Cytophaga
 BF = bacterial furunculosis
 BK = bacterial kidney disease
 BR = enteric redmouth bacterium
 PC = Ceratomyxa shasta (noninfectious stage) parasite
 PW = Myxobolus (Mysoxoma) cerebralis parasite
 Ratio = no positive fish or pools/no. sampled
 VE = EIBS virus
 VH = IHN virus
 VP = IPN virus

Table 4. Summary of diagnostics and health monitoring of juvenile salmon and steelhead at Idaho Columbia River tributary hatcheries.

<u>Facility</u>	<u>Date</u>	<u>Accessions</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Crooked River	7/1991	91-197	Dwor SC	0/20 BK
				0/4 bacty
				0/20 VH
				0/20 VP
	8/1991	91-222	Dwor SC	0/5 P I
				0/10 VH
				0/10 VP
				0/10 BK
	10/1991	91-303	Dwor SC	0/10 PX
				0/60 BK FAT
				0/60 BK ELISA
				0/60 VH
0/60 VP				
Magic Valley	1/1991	91-08	Pah STA	5/8 B C
				0/10 VH
				0/10 VP
	comments : Densities should be reduced: reduce stress.			
	1/1991	91-09	EF STB	2/8 B C
				0/10 VH
				0/10 VP
	Comments: Densities and stress should be reduced.			
	1/1991	91-10	Dwor STB	0/10 VH
				0/10 VP
	2/1991	91-21	Pah STA	3/8 B C
				0/10 VH
	2/1991	91-22	Dwor STB	0/10 VP
				0/8 bacty
	2/1991	91-23	EF STB	0/10 VH
				0/8 bacty
	2/1991	91-59	Dwor STB	0/10 bacty
				0/10 VH
				0/10 VP
0/60 BK				
Preliberation Sample				
3/1991	91-61	EF STB	0/60 VH	
			0/60 BK	
			0/60 VP	
Preliberation Sample				

Table 4. continued

<u>Facility</u>	<u>Date</u>	<u>Accessions</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Magic Valley (cont.)	3/1991	91-62	Pah STA	0/60 BK 0/60 VH 0/60 VP
Preliberation Sample				
	5/1991	91-166	Pah STA	0/10 VH 0/10 VP
	5/1991	91-167	HC STA	0/10 v 0/10 VP
	5/1991	91-168	Dwor STB	0/10 VH 0/10 VP
McCall	1/1991	91-12	SF SU	0/8 bacty 0/10 viro
	2/1991	91-35	SF SU	0/60 viro 0/60 BK
	3/1991	91-58	SF SU	1/4 bacty 0/10 viro
<u>Flavobacterium</u>				
	4/1991	91-83	SF SU	0/6 PC 0/6 PI
	5/1991	91-138	SF SU	0/10 bacty
Niagara Springs	1/1991	91-05	Pah STA	4/8 BC 0/10 viro
Epizootic caused by <u>F. psychrophilus</u> TM-100 treatment (medicated feed). Relief from mortality not to expectations.				
	1/1991	91-07	Pah/HC STA	0/8 BC 4/8 MAS 0/10 viro
Epizootic caused by <u>F. psychrophilus</u> . Now MAS causing mortality.				
	2/1991	91/20	Pah STA	5/8 BC 0/10 viro
	3/1991	91-50	Pah STA	0/60 BC 0/60 viro
Preliberation.				
	3/1991	91-53		4/4 BC 4/8 MAS
Environmental stress, overcrowding, hypoxia + pathogens.				
	4/1991	91-102	Pah STA	0/4 viro 4/4 BF
Fish released before identification completed. No treatment applied.				

Table 4. continued

<u>Facility</u>	<u>Date</u>	<u>Accessions</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Pahsimeroi	1/1991	91-15	Pah SU	0/10 viro
	2/1991	91-37	Pah SU	0/60 BK 0/60 viro
	3/1991	91-47	Pah SU	0/11 viro 0/8 BK
	5/1991	91-155	Pah SU	0/10 BK 0/8 bacty
Powell	3/1991	91-67	Kooskie SC	0/7 BK 0/5 viro
Rapid River	1/1991	91-13	RR SC	0/8 BK 0/10 viro
	2/1991	91-34	RR SC	0/60 BK 0/60 viro
	3/1991	91-57	RR SC	0/10 viro 0/4 bacty
	4/1991	91-84	RR SC	0/6 PI 0/6 PC
	5/1991	91-139	RR SC	0/10 BK 0/8 bacty
Sawtooth	1/1991	91-16	Saw SC	3/8 BC 0/12 BK
	1/1991	91-17	EF SC	0/8 BK 2/8 BC
	2/1991	91-38	Saw SC	0/40 BK 0/40 viro
	2/1991	91-40	EF SC	0/20 BK 0/20 viro
	3/1991	91-43	Saw SC	1/8 BC 1/10 viro
	3/1991	91-44	EF SC	0/8 bacty 1/10 viro
	3/1991	91-45	Saw SC	0/20 BK 0/20 viro
	3/1991	91-65	Saw SC	0/10 PW 0/6 bacty
	4/1991	91-120	Saw SC	2/2 BK
	5/1991	91-153	EF SC	By FAT TNC . 12/18 BK 4/4 MAS
Non segregated lots of EF SC.				
	5/1991	91-154	Saw SC	4/8 BK 0/4 bacty
High BK segregation groups.				

Table 4. continued

(a) Stock Abbreviations

SC = spring chinook
STA = A steelhead
STB = B steelhead
su = summer chinook

(b) Pathogen Abbreviations

BC = bacterial Cytophaga
BF = bacterial furunculosis
BGD = bacterial gill disease
BK = bacterial kidney disease
BR = enteric redmouth bacterium
EGD = environmental gill disease
LLD = lipoid liver degeneration
PC = Certomyxa shasta (noninfectious stage) parasite
PW = Myxobolus (Myxosoma) cerebralis parasite
Ratio = no positive fish or pools/no. sampled
VE = EIBS virus
VH = IPN virus
VP = IPN virus

Table 5a.

MAGIC VALLEY HATCHERY

MO/YR	STOCK	NO.FISH	FISH/kg	AVG TEMP.(C)	FLO.IND.	DEN.IND.	%MORT
JUN90	90PAHST	1181466	1116.0	15.1	1.46	0.36	6.72
JUN90	90EFST	425515	2228.2	15.1	0.65	0.21	7.88
JUN90	90DWORST	807174	704.2	15.1	1.75	0.43	0.92
JUL90	90PAHST	1167640	371.5	15.1	0.69	0.24	0.84
JUL90	90EFST	384211	568.9	15.1	0.44	0.17	1.21
JUL90	90DWORST	652254	279.5	15.1	0.74	0.24	0.34
AUG90	90PAHST	1158042	143.3	15.1	1.30	0.25	0.82
AUG90	90EFST	354538	198.9	15.1	0.82	0.16	7.72
AUG90	90DWORST	650232	125.8	15.1	1.26	0.25	0.28
SEP90	90PAHST	1155563	55.1	15.1	0.85	0.23	0.21
SEP90	90EFST	353172	81.6	15.1	0.52	0.17	0.39
SEP90	90DWORST	648451	68.3	15.1	0.66	0.18	0.27
OCT90	90PAHST	1117455	40.9	15.1	1.01	0.27	0.41
OCT90	90EFST	352088	48.9	15.1	0.73	0.24	0.31
OCT90	90DWORST	663943	38.7	15.1	0.98	0.27	0.32
NOV90	90PAHST	1122506	23.0	15.1	0.69	0.20	0.16
NOV90	90EFST	337800	25.6	15.1	0.53	0.31	0.34
NOV90	90DWORST	658526	24.0	15.1	0.65	0.18	0.07
DEC90	90PAHST	1121588	19.1	15.1	0.91	0.23	0.08
DEC90	90EFST	337514	20.5	15.1	1.39	0.34	0.08
DEC90	90DWORST	658009	19.5	15.1	0.84	0.21	0.08
JAN91	90PAHST	1121055	13.4	15.1	0.93	0.29	0.05
JAN91	90EFST	337326	14.8	15.1	0.70	0.26	0.06
JAN91	90DWORST	657260	14.4	15.1	0.84	0.26	0.11
FEB91	90PAHST	1120747	10.1	15.1	1.16	0.35	0.03
FEB91	90EFST	337207	10.4	15.1	0.90	0.32	0.04
FEB91	90DWORST	656883	11.5	15.1	0.99	0.30	0.06
MAR91	90PAHST	1120299	7.7	15.1	1.45	0.41	0.04
MAR91	90EFST	337031	8.6	15.1	1.06	0.37	0.05
MAR91	90DWORST	656369	8.8	15.1	1.24	0.43	0.08
APR91	90PAHST	1094200	8.4	15.1			0.07
APR91	90EFST	334700	9.7	15.1			0.03
APR91	90DWORST	633100	10.1	15.1			0.03

PAHST - Pahsmeroi A steelhead

EFST - East Fork B steelhead

DWORST - Dworshak B steelhead

Table 5b.

McCALL HATCHERY

MO/YR	STOCK	NO.FISH	FISH/kg	AVG TEMP.(C)	FLO.IND.	DEN.IND.	%MORT
JUN90	89SFSU	710846	99.1	55.0	0.51	0.09	0.19
JUL90	89SFSU	710112	67.4	53.0	0.76	0.13	0.10
AUG90	89SFSU	709890	40.6	50.0	0.94	0.17	0.03
SEP90	89SFSU	709713	33.2	46.0	1.08	0.19	0.02
OCT90	89SFSU	709641	27.2	45.0	1.29	0.23	0.01
NOV90	89SFSU	709488	25.7	40.0	1.33	0.24	0.02
DEC90	89SFSU	708905	24.1	39.25	1.37	0.24	0.08
DEC90	90SFSU	49476	1050.0	39.25	0.40	0.20	0.65
JAN91	89SFSU	708779	21.5	37.0	1.43	0.27	0.01
JAN91	90SFSU	449456	1208.36	37.0	3.95	0.32	0.31
FEB91	89SFSU	708635	22.9	38.0	1.58	0.25	0.02
FEB91	90SFSU	1002473	1058.93	38.0	5.44	0.29	0.40
MAR91	89SFSU	708600	23.8	38.0	1.30	0.23	0.004
MAR91	90SFSU	1000050	760.98	38.0	3.45	0.35	0.24
APR91	90SFSU	996197	614.02	39.0	2.58	0.367	0.5

SFSU = South Fork summer chinook

5d.

EROI HATCHERY

STOCK	NO.FISH	FISH/kg	AVG TEMP.(C)	FLO.IND.	DEN.IND.	%MORT	MORT
89PAHSU	138944	694.6	7.2	0.62	0.25	0.10	.34
89PAHSU	183530	432.6	10.1	0.71	0.17	0.30	.20
89PAHSU	229642	226.8	11.4	1.80	0.43	14.91	.82
89PAHSU	229193	147.7	17.1	0.42	0.02	0.20	.10
89PAHSU	228773	102.5	13.9	0.53	0.02	0.18	.04
89PAHSU	228403	74.1	13.0	0.55	0.03	0.16	.06
89PAHSU	228175	52.9	13.4	0.62	0.04	0.10	.02
89PAHSU	227941	46.3	8.9	0.77	0.04	0.10	.02
89PAHSU	227842	43.0	5.2	0.93	0.04	0.04	.02
89PAHSU	227792	42.3	3.0	0.94	0.04	0.03	.04
89PAHSU	227742	41.3	3.2	0.96	0.04	0.02	.02
90PAHSU	453004	2013.5	3.2	0.41	0.14	0.83	.18
89PAHSU	227691	37.5	4.9	0.92	0.05	0.02	.15
90PAHSU	611666	1575.3	5.9	0.49	0.14	0.26	.51
89PAHSU	227500	34.0	6.4	0.99	0.06	0.08	.12
90PAHSU	608893	942.7	7.3	0.68	0.22	0.45	.14
90PAHSU	608001	644.4	8.8	0.81	0.29	0.15	.03
90PAHSU	607625	308.9	9.9	0.86	0.02	0.06	.04

. Pahsimeroi summer chinook

Table 5f.

SAWTOOTH HATCHERY

MO/YR	STOCK	NO.FISH	FISH/k9	AVG TEMP.(C)	FLO.IND.	DEN.IND.	%MORT
APR90	89SWTSC	660390	346.1	5.6	1.14	0.25	0.20
APR90	89EFSC	99075	350.6	5.6	0.83	0.34	0.25
MAY90	89SWTSC	659259	240.3	6.7	0.45	0.06	0.17
MAY90	89EFSC	98845	235.8	6.7	0.36	0.05	0.23
JUN990	89SWTSC	657871	176.4	11.4	0.36	0.07	0.21
JUN90	89EFSC	98677	169.7	11.4	0.30	0.06	0.17
JUL90	89SWTSC	656773	94.8	14.0	0.36	0.11	0.17
JUL90	89EFSC	98659	97.0	14.0	0.38	0.09	0.02
AUG90	89SWTSC	655584	72.8	13.7	0.42	0.13	0.18
AUG90	89EFSC	98584	70.5	13.7	0.37	0.12	0.08
SEPBO	89SWTSC	654995	57.3	12.3	0.51	0.16	0.09
SEP90	89EFSC	98532	59.5	12.3	0.42	0.13	0.05
OCT90	89SWTSC	650371	52.8	10.1	0.52	0.16	0.10
OCT90	89EFSC	98483	50.7	10.1	0.46	0.15	0.05
NOV90	89SWTSC	651884	52.9	3.8	0.52	0.16	0.07
NOV90	89EFSC	98471	50.7	3.8	0.46	0.15	0.01
DEC90	89SWTSC	651737	52.9	1.5	0.52	0.16	0.02
DEC90	89EFSC	98455	50.7	1.5	0.46	0.15	0.02
JAN91	89SWTSC	651529	52.9	1.7	0.52	0.16	0.03
JAN91	89EFSC	98413	50.7	1.7	0.46	0.15	0.04
FEB91	89SWTSC	650900	57.3	3.4	0.48	0.15	0.10
FEB91	89EFSC	98302	66.8	3.4	0.35	0.11	0.11

SWTSC - Sawtooth spring chinook

EFSC - East Fork Salmon spring chinook

Appendix 1. Summary of Project Objectives and Tasks

Objective 1.0 Start-up

Task 1.1 Acquire competent staff: complete

Task 1.2 and 1.3 Acquire equipment and supplies: final year equipment purchases are being made. Equipment installation will be accomplished as it is received. Supply purchases are ongoing. In June 1991 the laboratory moved into a new laboratory facility (independent of this BPA contract).

Objective 2.0 Steering Committee

Task 2.1 Attend quarterly meetings: ongoing

Task 2.2 Technology transfer is being accomplished as per 1990 Annual Report, Appendix 2. During this report period considerable effort has gone into database development. This database will continue to serve Idaho's fish health needs following the termination of the BPA fish health monitoring project.

Task 2.3 Facility impediment list: completed

Objective 3.0 Conduct augmented fish health monitoring

Task 3.1 Organosomatic analyses per contract plus additional work is done at all anadromous stations: ongoing

Task 3.2 Conduct field and lab work as per Table 2.1: ongoing

Objective 4.0 Conduct studies of hatchery water supplies

Task 4.1 Submit water sampling plan: completed

Task 4.2 Water sample collection plan: work awaiting BPA direction

Task 4.3 Record flow/density indices: ongoing

Objective 5.0 Record, analyze, report data

Task 5.1 Data forms submittal: completed

Task 5.2 Record data: ongoing

Task 5.3 Submit data collected each quarter with quarterly report: ongoing

Objective 6.0 Estimate benefits of project

Task 6.1 Is being collected and analyzed and will be presented in final report.

Task 6.1.1

Task 6.1.2

Task 6.1.3

Task 6.1.4

Task 6.1.5